Advanced Technology Materials, Inc.
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Solid Scrubber for Semiconductor Industry

DESCRIPTION OF THE TECHNOLOGY

With support from the Environmental Protection Agency's (EPA) Small Business Innovation Research (SBIR) Program, ATMI, Inc., developed an innovative solid scrubbing material designed especially to reduce toxic air emissions from the semiconductor industry. With 30 times the capacity of activated carbon, the new material became the core of the Novapure Dry Scrubber System that was introduced into the market in 1991. The Novapure System has broad application in the electronics industry and in research and development institutions where small amounts of hazardous materials are routinely employed in chemical vapor deposition (CVD) processes.

Since the award of this SBIR contract, ATMI has developed a family of novel vent gas scrubbers that are cost effective in reducing toxic air emissions from small quantity CVD processes as well as toxic air emissions released by semiconductor manufacturers. ATMI process scrubbers are smaller than traditional air pollution control equipment. Instead of a single large installation outside a fabrication plant, ATMI's abatement products are small enough to be located at each individual pollution source.

SIGNIFICANCE OF THE TECHNOLOGY

The rapid growth of the American microelectronics industry has spawned new environmental challenges associated with the processes used to prepare semiconductor chips that are key components of sophisticated electronic devices. Silane, phosphine, and arsine are used in CVD steps in semiconductor fabrication. Although large companies have built expensive facilities for handling small amounts of these materials, small manufacturers have vented the gases to the atmosphere or used similar unacceptable techniques. As production increased, however, venting of these gases to the atmosphere was no longer an option.

The Emergency Planning and Community Right-to-Know Act designates silane, phosphine, and arsine as extremely hazardous chemicals used by the semiconductor industry; these chemicals are also regulated as toxic chemicals under the Clean Air Act. ATMI's scrubber system transforms these toxic gases into nonvolatile, benign solids through chemical absorption. By neutralizing, solidifying, and concentrating hazardous effluent up to 20,000 times, this technology helps to eliminate toxic air emissions and minimize solid toxic wastes from small semiconductor manufacturers.

COMMERCIALIZATION SUCCESS

ATMI was granted four U.S. patents on its dry scrubber technology, and in just 3 years, the company's annual sales grew to nearly $6 million. To expand its environmental control equipment market, in 1994 and 1995 ATMI acquired the rights to alternative technologies, including wet scrubbing and combustion scrubbing. These acquisitions increased ATMI's annual revenues to nearly $30 million at that time.

SBIR Impact

- **ATMI's dry scrubber system reduces toxic air emissions from the semiconductor industry.**
- **The innovative solid scrubbing material, the core of ATMI's Novapure dry scrubber, has 30 times the capacity of activated carbon.**
- **This SBIR contract led to the development of a family of novel vent gas scrubbers that are cost effective in reducing toxic air emissions from chemical vapor deposition processes as well as several new safety-related products that eliminate the use of toxic gases in the semiconductor industry.**
- **ATMI has received the Tibbetts Award in recognition of the company's excellence in the area of high technology, as well as several other awards.**
- **ATMI has grown from four employees in 1987 to nearly 1,100 employees; revenues for 2001 were $213 million.**

ATMI's Novapure Dry Scrubber System, designed to reduce toxic air emissions from the semiconductor industry, was introduced into the market in 1991.

ATMI's patented SDS® adsorbent technology stores toxic gases below atmospheric pressure, removing the concerns of catastrophic releases of high-pressure hazardous gases.

ATMI is the largest supplier of point-of-use emission control equipment for the semiconductor industry in the world. This SBIR project led to the development of several new safety-related products for the semiconductor industry. One product, called the Safe Delivery Source®, or SDS®, that uses absorbent materials similar to those of the dry scrubber system, eliminates the use of high-pressure toxic gases in the semiconductor industry. ATMI's SDS® Sub-Atmospheric Gas Delivery Systems represent the company's largest source of revenue.

AWARDS AND COMPANY HISTORY

In recognition of its outstanding achievements in technology innovation, ATMI received the Tibbetts Award in 1996. This award is presented by the U.S. Small Business Administration to companies associated with the SBIR Program that are models of excellence in the area of high technology. In 1997, ATMI was recognized as an Outstanding Small Business Enterprise by EPA. ATMI also was identified as one of America's 100 Fastest Growing Companies by *Individual Investor Magazine* in 2000, and ranked 63rd on *Fortune's* list of 100 Fastest Growing Companies. In 2002, ATMI was included in *Business 2.0's* list of Fastest Growing Companies, and made the Connecticut Technology Fast 50 list for the sixth time. Since 1987, when ATMI was awarded the EPA SBIR Phase I contract, the company has grown from four employees working in a small garage in New Milford, CT, to nearly 1,100 employees in numerous locations around the world. Revenues in 2001 were $213 million. Originally called Advanced Technology Materials, Inc., the company changed its name to ATMI, Inc., in 1997.

What is the SBIR Program?

EPA's Small Business Innovation Research (SBIR) Program was created to assist small businesses in transforming innovative ideas into commercial products. The SBIR Program has two phases—Phase I is the feasibility study to determine the validity of the proposed concept and Phase II is the development of the technology or product proven feasible in Phase I. EPA also offers Phase II Options to accelerate the commercialization of SBIR technologies and to complete EPA's Environmental Technology Verification (ETV) Program. For more information about EPA's SBIR Program and the National Center for Environmental Research, visit http://www.epa.gov/ncer/sbir.